The Los Alamos Electric-Field-Change Sensor Array

K. Wiens*, R. S. Massey, X-M Shao,
M. Eberle, and K. B. Eack

Los Alamos National Laboratory

LA-UR-3721

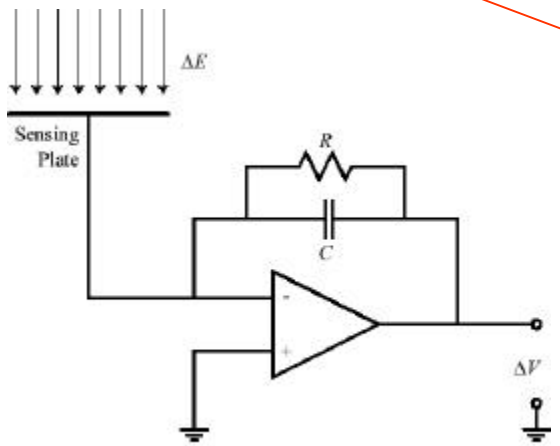
*Presently at New Mexico Tech

Main Purposes

- Provide “ground truth” for FORTÉ data.
  - Described in poster session yesterday.
- Continue work of Smith and Shao on narrow bipolar events.
  - Poster A22A-11, next talk in this session

Station Design

- Flat-plate antenna (under rain-cover)
- Integrating charge amplifier



- Remotely controllable bipolar trigger
- 1 MS/s 12-bit A/D, 8-16 ms records, 50% pretrig
- GPS time-tagging (2 μs), can collect 30 events/second.
- Linux-based PC on internet. Data downloaded nightly to Los Alamos.

Array Geometry

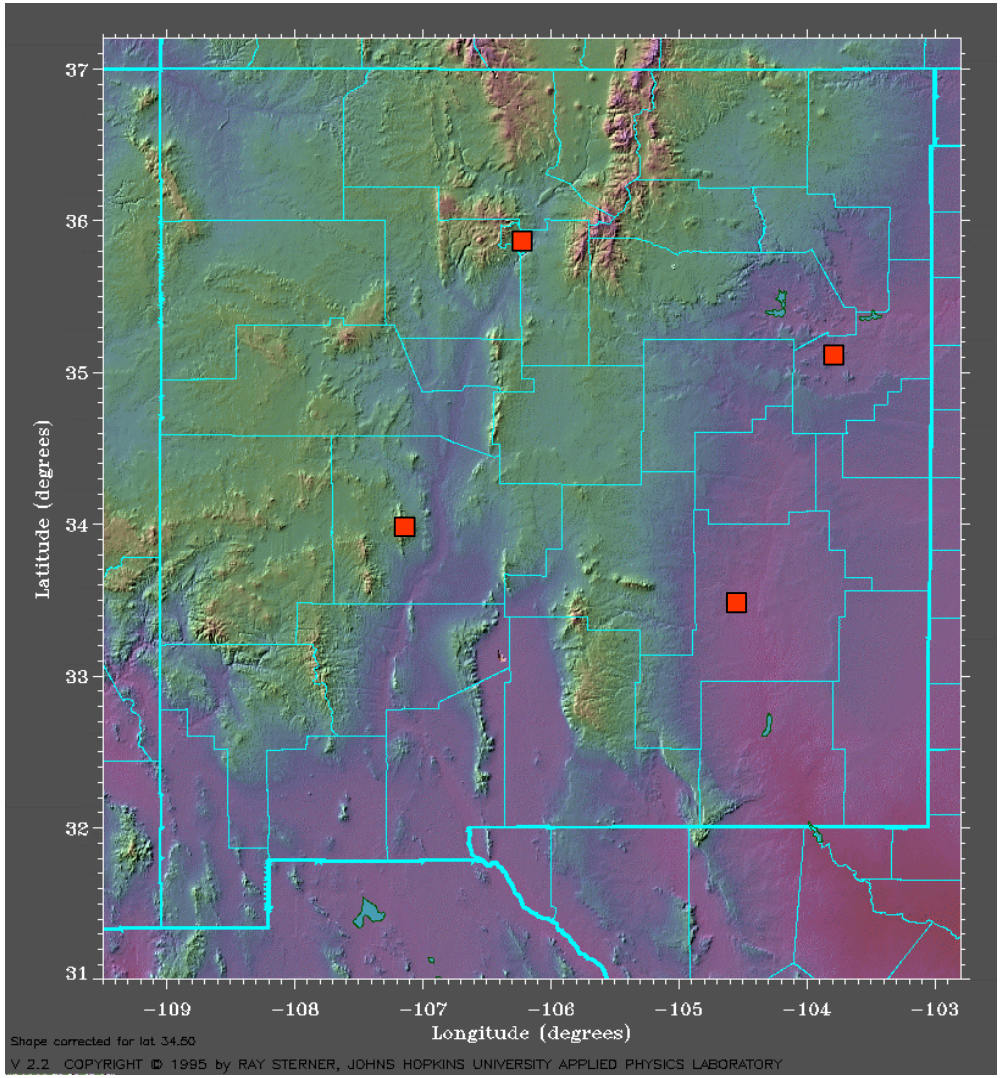
Stations at:

Los Alamos

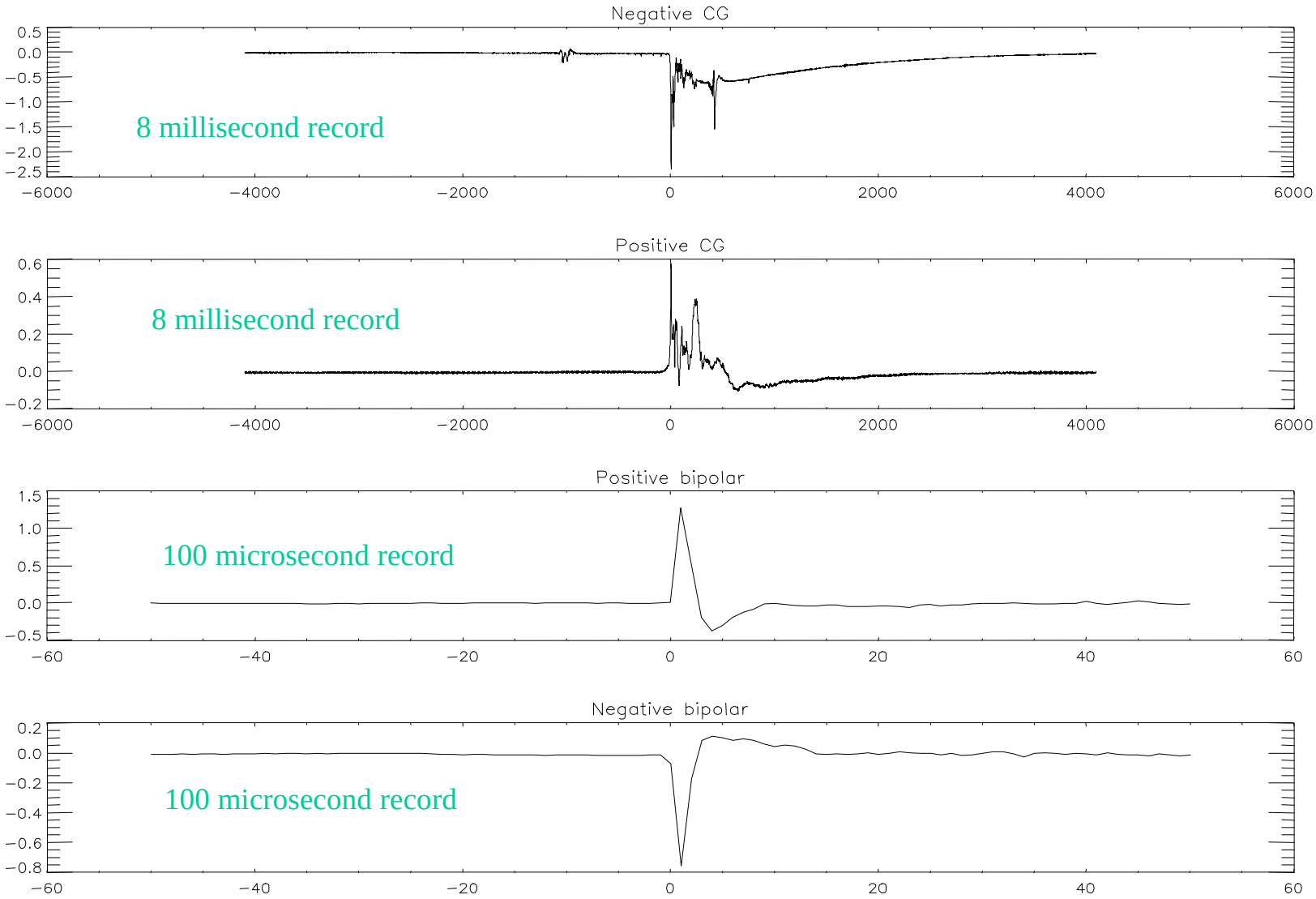
Socorro (NM Tech)

Tucumcari (Mesa Tech)

Roswell (ENMU)



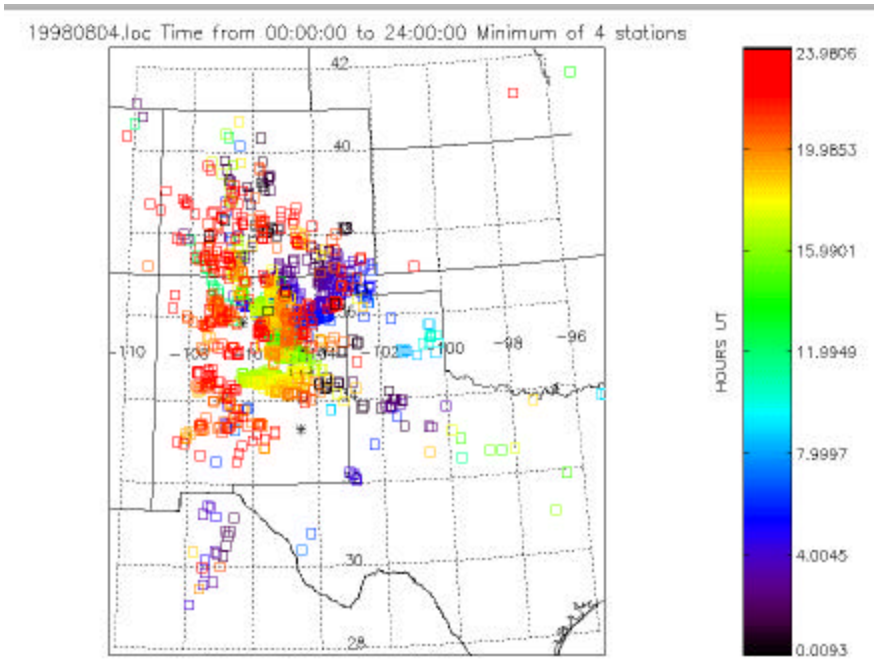
Sample waveforms



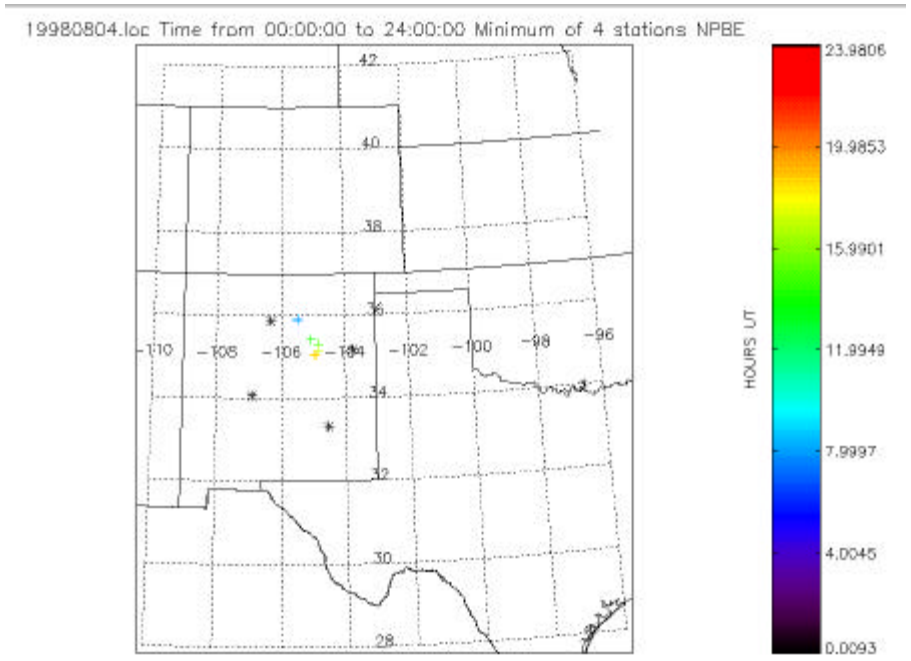
Sample maps (August 4)

Locations determined from TDOA using adaptive simplex minimization of chi-squared

ALL 4-STATION EVENTS

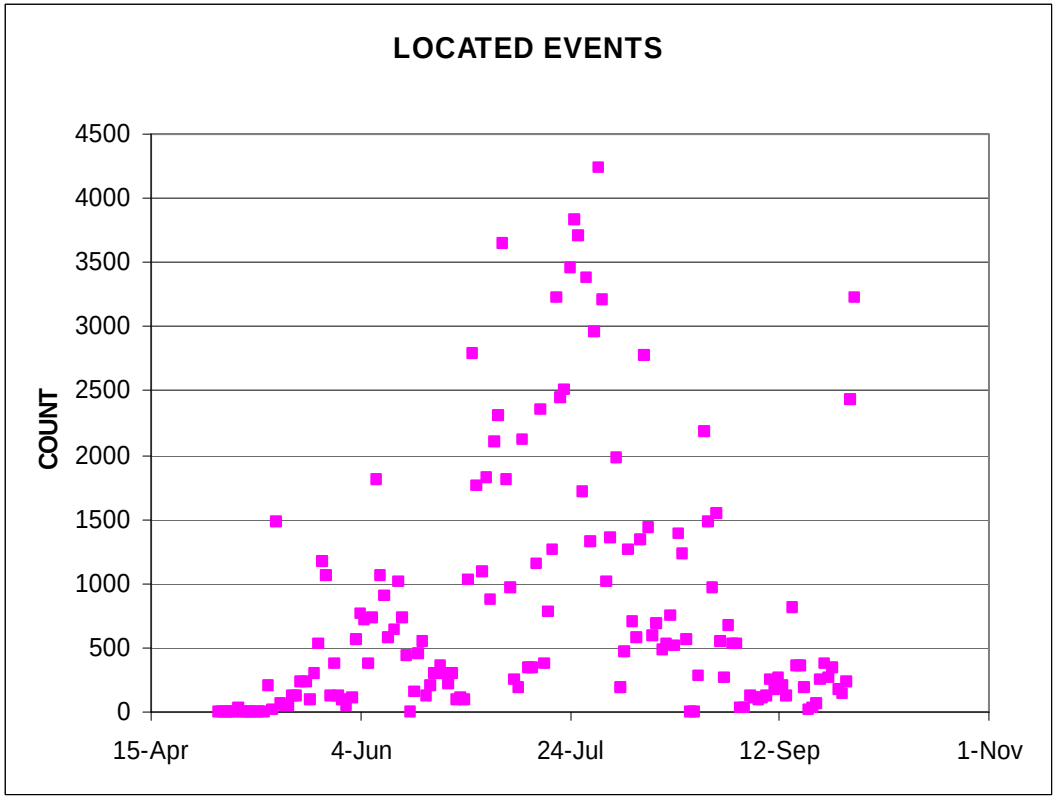


POSITIVE BIPOLAR EVENTS



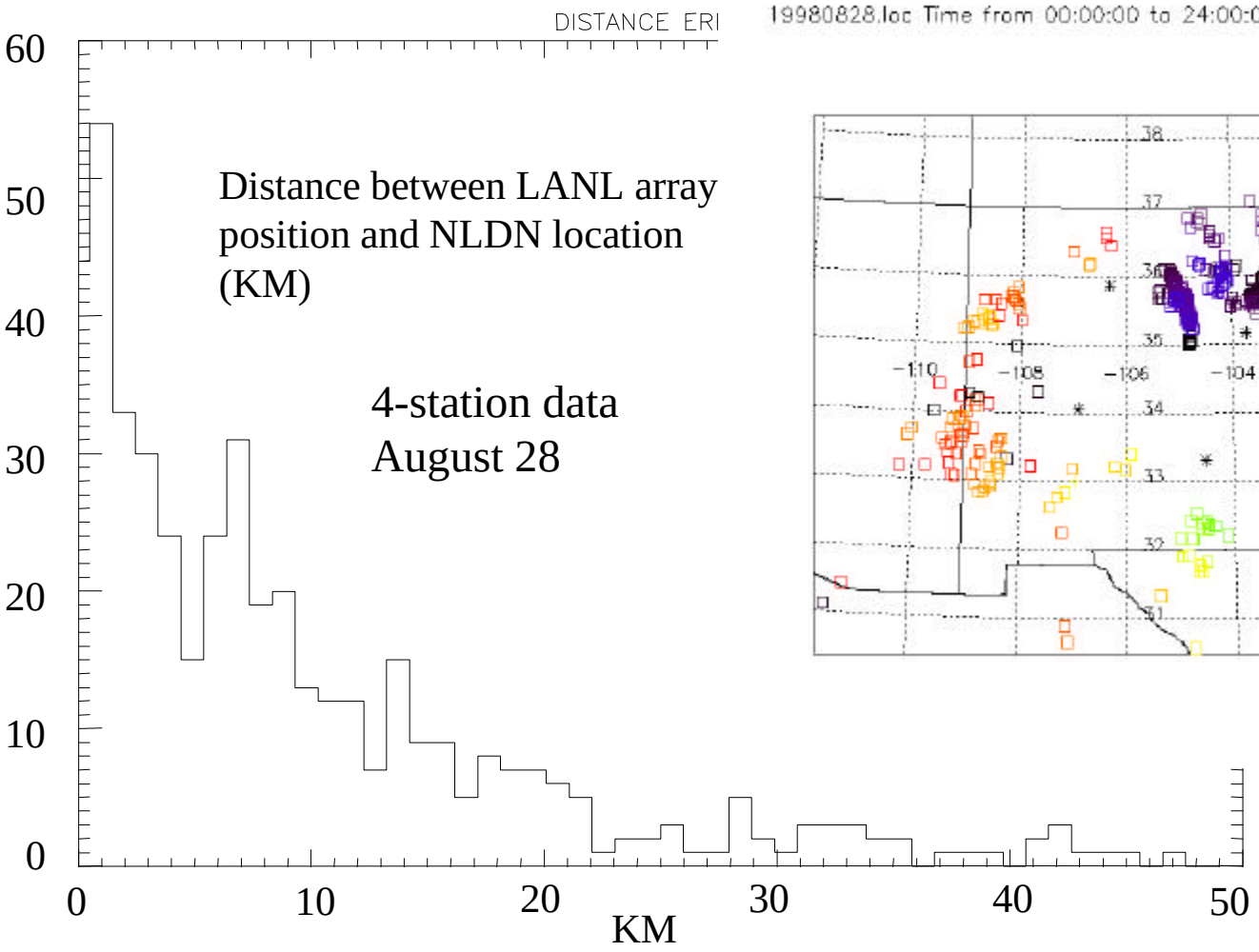
Color denotes time

Number of located events per day



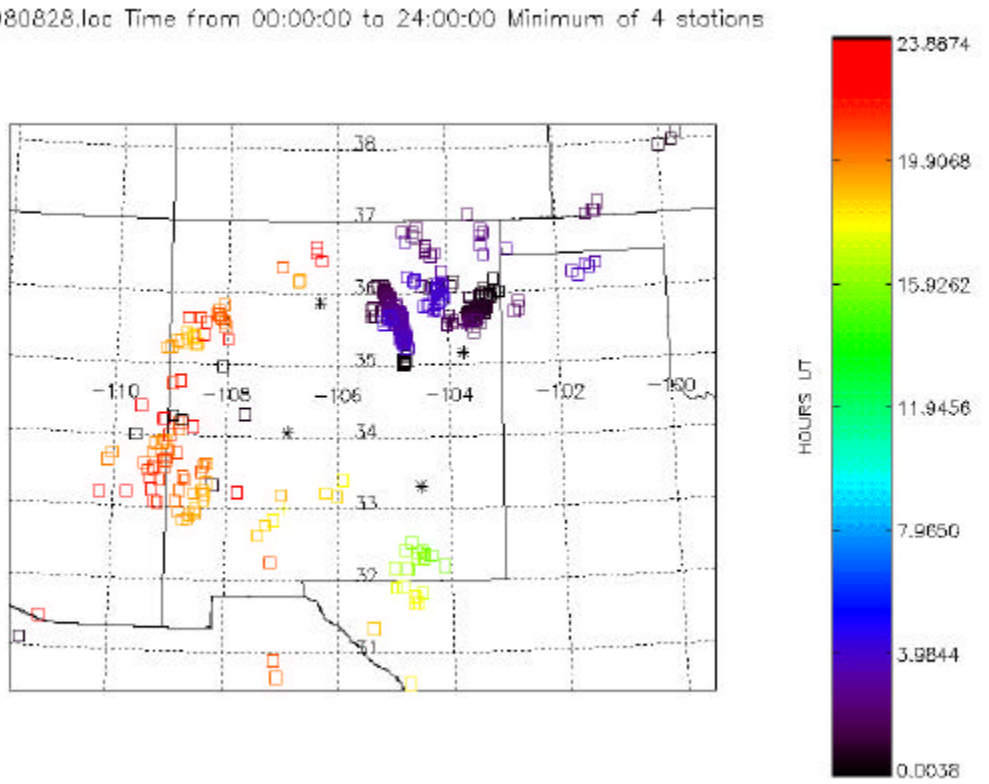
100,000 total events

Location accuracy (compared to NLDN)



Distance between LANL array position and NLDN location (KM)

4-station data
August 28

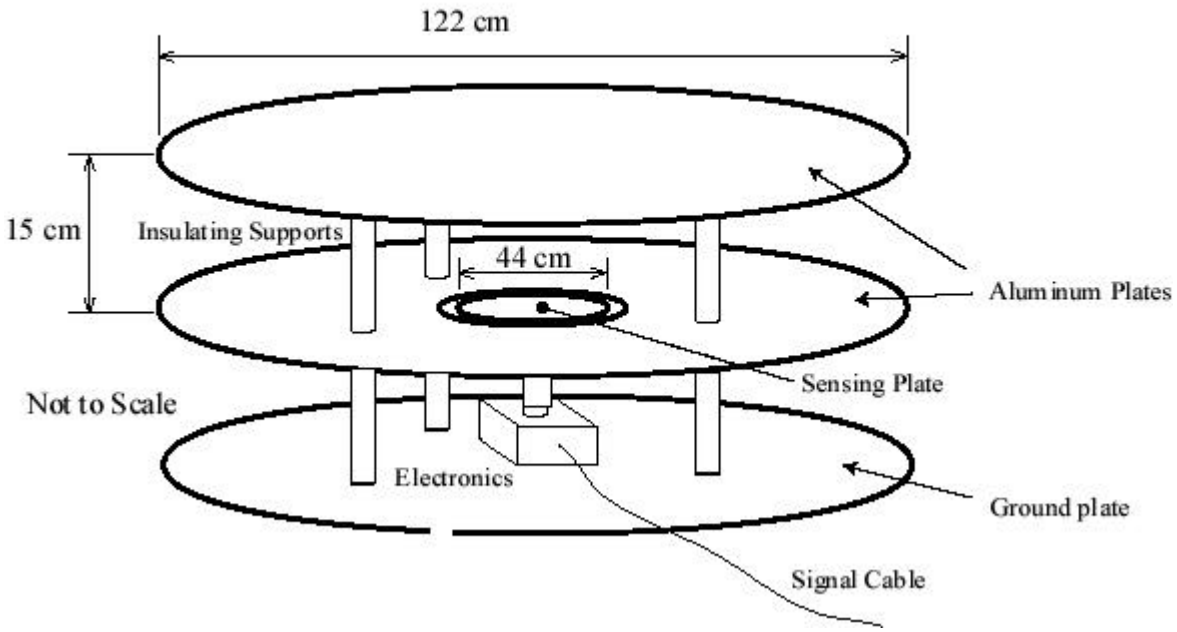


Calibrations

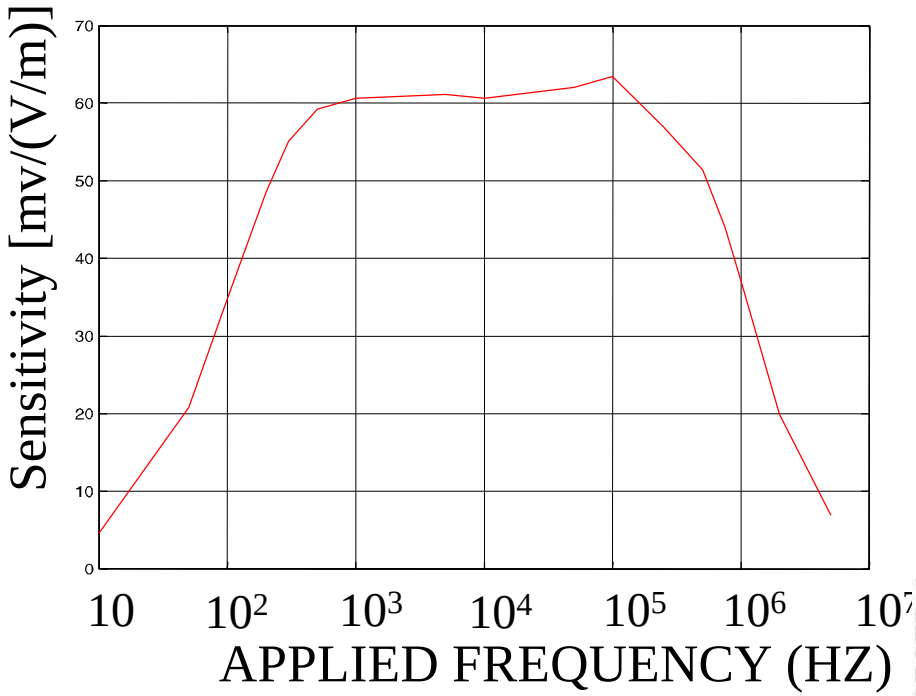
Performed at Los Alamos and Socorro.

Sine-wave excitation.

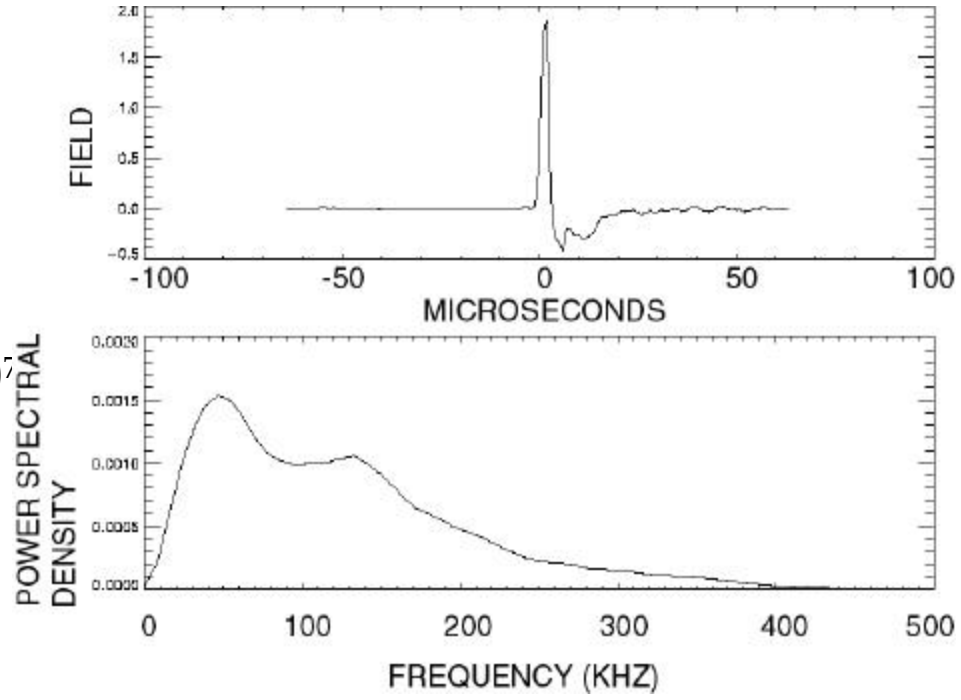
Collect events with this calibrated antenna and the station and cross-calibrate.



Frequency response



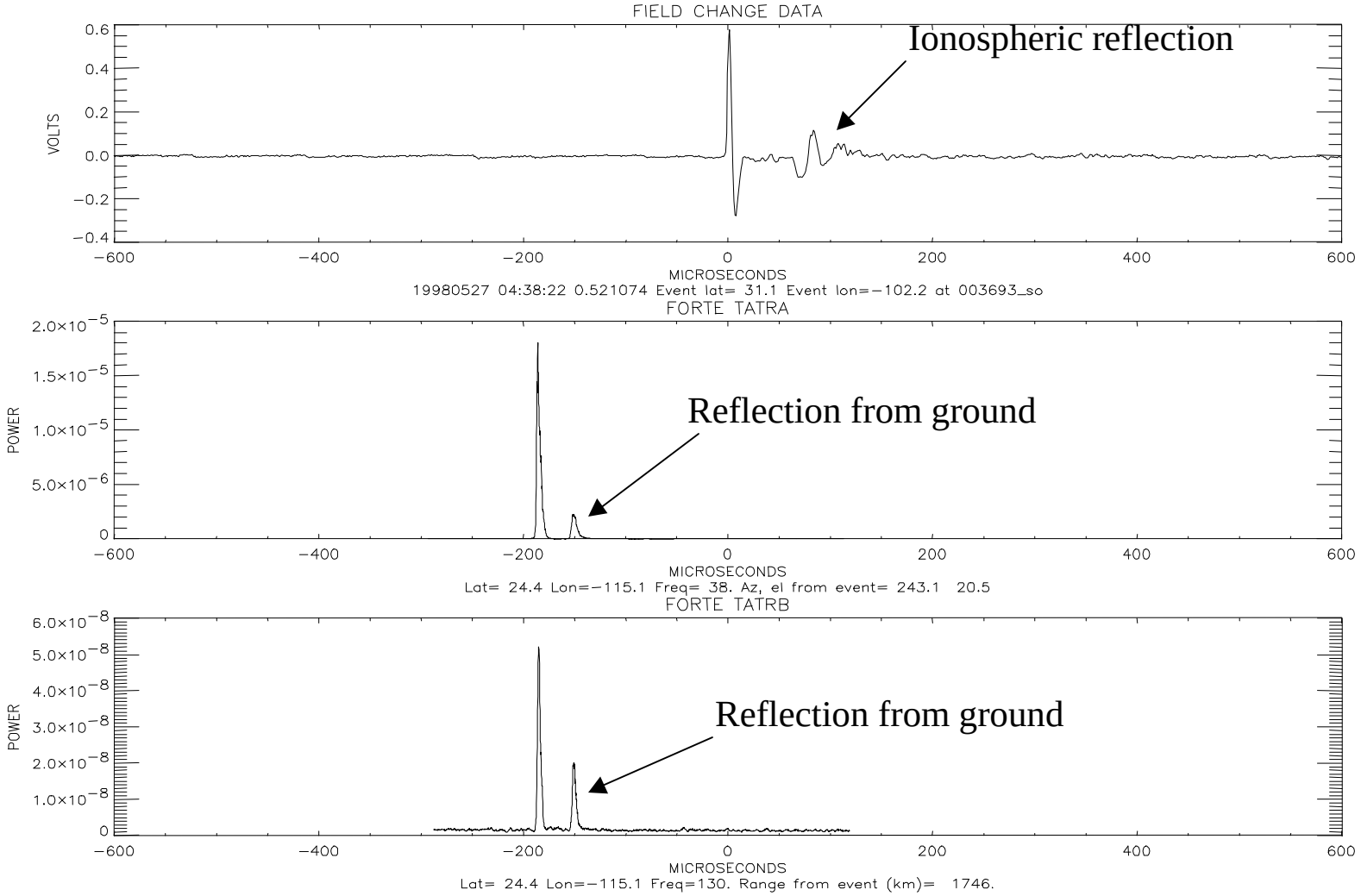
SPECTRUM OF A NARROW BIPOLAR EVENT DROPS OFF MORE RAPIDLY THAN THE DETECTOR.



Summary

- The array is operating full time.
- We’ve collected and located nearly 100,000 events.
- Data are being used for studying narrow bipolar events, FORTE data, and effects of smoke.
- We plan a modest expansion for next summer.
- We’re interested in collaborations with other groups.

Example of NPBE received by FORTE



Times are corrected to the event location (but accuracy is imperfect)